Innovative Good Practice for Piloting

Deliverable 3.4

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Abstract	The report provides analysis and preliminary recommendations for innovative good practice for piloting virtual programmes in schools. It draws on a literature review on the topic of innovative good practice for teachers.
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Contents

1   The brief

This is Deliverable 3.4 of Work Package 3. The Deliverable Title is:

Innovative Good Practice for Piloting

The Work Package Title is:

Analysis & Recommendations

It runs from month 6 [June 2011] until the end of the project [December 2012].

Deliverable 3.4 is summarised in the work plan as follows:

This report is the first Deliverable from subtask 3.2. It has P2 Sero as lead author, with help from Aarhus, Tensta and MENON. (The lead author person will be different from the lead author person for D.3.3, so as to best manage the workload within Sero.)

The report is needed in late Autumn 2011 so that teachers in the five pilot institutions can draw on it to develop innovative practice for the teaching terms from January 2012 to summer 2012. It is input to WP6 Piloting, not an output from it.

2   Introduction

Worldwide, schools have been turning to virtual learning to improve student performance, save money and empower teachers (Blackboard 2011). Online education can increase the range of courses/programmes available to students; offer improved flexibility; and help meet the goal of teaching students much-needed 21st century skills (Berge and Clark 2009).

Most of the literature to date on virtual schooling has concentrated upon first defining and then describing the benefits and the challenges of K-12 online learning (Cavanaugh et al. 2009). It is only in recent years that researchers have set their sights on specifically identifying good practice in virtual teaching and learning – and indeed, what it takes to deploy a new online programme in the first place. The research base in K-12 distance education continues to expand and includes both comparative studies and studies that attempt to identify the factors associated with instructional quality and effectiveness (Rice 2006). It is a complex topic, in which the complementary strands of pedagogy and teaching methodologies must be considered in the context of both technological use and administrative realities.

Based on a survey of the literature on innovation and good practice in virtual schools, this report seeks to provide analysis and preliminary recommendations for innovative good practice in piloting virtual schools. It includes the results of a literature review on the topic of innovative good practice for teachers.

The main themes emerging in our research, and which we have used as organising principles here, are:

- Policy and planning
- Advice for teachers
- Teacher training
- Pedagogy and learning styles
- Content development and instructional design
- Technological innovation

Highlights of the "good practice" literature in each category are discussed below. Given the scope of this study and the nature of the project, our review is representative but not comprehensive. However, we are confident that – of the hundreds of documents examined – we have identified numerous key documents and salient points which will aid educators preparing their own virtual schools or programmes.

Our specific literature review methodology is examined below.

3   Highlights: preliminary recommendations

Recurring themes in the literature examined suggest that educators piloting virtual programmes in their schools consider the following strategies:

- **Secure advance and on-going support** from the educational community, e.g. school board, department leads, parents, community groups, technical support staff and others
- **Establish clear policies** spelling out how virtual courses will be created and delivered
- **Use a combination of synchronous and asynchronous learning tools** in online courses (e.g. both Elluminate broadcasts and Blackboard discussion boards)
- **Train teachers well** in the technologies they must utilise – deploying virtual, rather than face-to-face, professional development courses
- **Ensure direct and frequent communication between teachers and students**, be it through instant messaging, asynchronous discussion boards, telephone or other means
- **Provide adequate technical support** for both teachers and students
- **Engage parents or guardians directly** in the learning process
- **Have quality assurance and evaluation procedures** in place

These will be reviewed in context below, following a review of our literature search methodology.

4   Shortlist of guides and standards

The reports identified below are in agreement on most critical points regarding good practice in the development and delivery of online courses for students in primary and secondary education. Most are aligned to the US educational system, but the principles addressed are universal. It is recommended that educators piloting virtual programmes areas review these documents.

- *National Standards for Quality Online Teaching Version 2* (2011)
  http://www.inacol.org/research/nationalstandards/iNACOL_TeachingStandardsv2.pdf
  International Association for K-12 Online Learning (iNACOL) standards for teaching online.

- *National Standards for Quality Online Courses* (2011)
  http://www.inacol.org/research/nationalstandards/iNACOL_CourseStandards_2011.pdf
  International Association for K-12 Online Learning (iNACOL) standards for online courses.

- *Grades 6-12 Edition -- QM's Rubric Standards* (2010)
  http://www.qmprogram.org/g6-12-rubric-standards-0
  Quality Matters Program's process to ensure quality in online courses.

- *The ISTE NETS and Performance Indicators for Teachers (NETS•T)* (2008)
  http://www.qmprogram.org/g6-12-rubric-standards-0
  International Society for Technology in Education standards sand performance indicators for teachers.

- *2010 Report on State Virtual Schools in SREB States: Executive Summary* (2011)
  http://publications.sreb.org/2010/2010ExecutiveSummary.pdf
  Annual SREB survey of the region's state virtual schools identifies trends in online education for policymakers and practitioners.

- *Virtual Schools: What Every Superintendent Needs to Know* (2009)
  http://www.usdla.org/assets/pdf_files/DL_6-2.pdf
  Written for the chief administrative officer of a US K-12 school district, but relevant to deploying online learning in any schools context.

5   Literature review

In preparation for this deliverable, a literature review was undertaken to examine "innovative good practice for teachers" in virtual schools worldwide. Our study identified 129 relevant articles, with a strong focus on US, Canada, Australia and New Zealand schools (though no regions have been excluded). Although the VISCED project focuses on students in the 14-21 age group, publications that focus on primary schooling have been included here, due to their obvious relevance in this context.

As noted above, this bibliography is deemed to be representative but not exhaustive.

5.1   Methodology and subject matter

Books, peer-reviewed journals articles, reports and other high-quality publications were collected using the Mendeley reference management and social networking system.[1] These were then added to a private Mendeley Group entitled "Virtual schools – innovative good practice for teachers".

For this study we undertook four days of comprehensive research using the federated EBSCOhost online research databases[2]. EBSCOhost searches multiple databases simultaneously, including:

- ERIC (Education Resources Information Center), the world's largest digital library of education literature
- Academic Search Complete, a comprehensive scholarly, multidisciplinary full-text database of more than 13,000 abstracted and indexed journals
- Education Research Complete, which provides indexing and abstracts for more than 2,100 journals (and full text for 1,200)
- LISTA (Library, Information Science & Technology Abstracts), which indexes more than 700 journals plus books, research reports and proceedings.[3]

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[1] See http://www.mendeley.com/
[2] See http://www.ebscohost.com

EBSCO Searches were performed by Keyword, Subject, and Author. A modicum of general Google searching was performed as well, and relevant reference lists and bibliographies were examined on an item-by-item basis. As usual, citations within articles proved invaluable in directing our searches.

5.1.1 Keywords

When using the search tools named above, productive keyword search terms of note (when used in combination) included:

> *K-12, high school(s), secondary school(s); innovate, innovative, innovation; good practice(s), best practice(s), practice(s); pilot(s), piloting; teacher(s), teaching, instructor(s), instruction; technology; virtual; virtual schools; online; distance, distance education; synchronous, asynchronous; videoconferencing; Elluminate; Canada, Australia, New Zealand;*

Numerous other terms yielded results that were more isolated or sporadic.

5.1.2 Geography

Most articles included in our survey are written by American authors, and draw on data from studies of American virtual schools – unsurprising in that there are considerably more virtual schools in the US than in any other country.[4] We added additional geographical search terms to specifically examine the Canada, Australia and New Zealand contexts, though these were not very successful.

5.1.3 Target audience

It seems that secondary school teachers are not, for the most part, the stakeholders expected to be reading articles on virtual schooling. Perhaps because of the nature of education within the US,[5] the target reader is more often an administrative or managerial organiser. The titles collected in our study reflect this more general approach to the topic of virtual schools. (One does wonder somewhat cynically whether teachers are not often given the agency to innovate, but – within the US anyway – are rather assigned technologies, curricula and content delivery modes based on budgetary decisions taken at the local, district or state level.) Indeed, extrapolating *guidance for teachers in particular* has taken some effort.

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[3] See http://www.eric.ed.gov, http://www.ebscohost.com/academic/academic-search-complete, http://www.ebscohost.com/academic/education-research-complete and http://www.ebscohost.com/academic/library-information-science-technology-abstracts-lista

[4] There are 264 American virtual schools described on the VISCED wiki at the time of writing – see http://virtualcampuses.eu/index.php/USA

[5] See http://en.wikipedia.org/wiki/Education_in_the_United_States and http://www.virtualcampuses.eu/index.php/United_States

5.1.4 Educational level

Although there is a rich and rapidly expanding base of articles addressing innovative good practice and pedagogy at the primary and secondary (K-12) level, this body of literature is dwarfed in comparison to that for undergraduate and postgraduate education. In a number of cases we have included higher education studies which offer lessons transferrable to other contexts.

5.1.5 Educational mode

There is much literature addressing technological innovation within traditional, blended or hybrid schools; the general topic of "technological innovative in the classroom" is an expansive one. Many articles work from the assumption that students are based in traditional face-to-face classrooms only. In keeping with the VISCED definition of virtual school, wherein all or most instruction is delivered remotely via the internet (and most homework and collaborative work are undertaken online as well), we have not generally analysed articles which address the use of technology **only** within the traditional classroom setting – though there are always exceptions.

5.2 Underlying conceptualisations in the literature

We have undertaken extensive tagging of the 129 publications collected in Mendeley, and a review of "top tags" reveals some underlying conceptualisations of the research. The top tags as of 31 December 2011 are as follows:

Top tags in this group

USA · Innovation · Asynchronous Learning · Synchronous Learning · Blended Learning · Best Practice · Blogs · Wikis · Instructional Design · Professional Development · Instant Messaging · Pedagogy · Standards · Curriculum · Australia · Content Development · Canada · Evaluation · Guide · Teacher Training · Elluminate · Videoconferencing · iNACOL · Lessons Learned · Assessment · Game-based Learning · Mobile Learning · Blackboard · Effectiveness · WebCT · Moodle · Case Study · Learning Theories · Pilot Programs · Virtual Worlds · Florida Virtual School · Completion Rates · Good Practice · Policy and Planning · Trends · Homeschoolers · FLVS · Emerging Technologies · Whiteboards · UK · Quality · Florida · Webcasts · Interactive Whiteboards · Literature Review

Figure 1. Tag cloud from "Virtual schools – innovative good practice for teachers" group in Mendeley (most popular tags from top left)

This tag cloud proves an excellent starting point for visualising this body of literature as a whole; one can track the "most popular" topics from top left. [6] We find that:

- Most articles are written by "USA"-based authors, or focus on US-based schools.
- Modes of innovation within the online schooling context are commonly – e.g. in nearly half of cases – abstracted as either "Asynchronous" or "Synchronous" Learning.
- "Blended Learning" is often discussed alongside purely online learning.
- "Blogs" and "Wikis" are common "go-to" examples of technological innovations in virtual schools. "Instant Messaging" figures prominently in distance learning contexts as well.
- Other top learning tools/modes discussed are "Mobile Learning", "Videoconferencing", "Game-based Learning", and "Virtual Worlds".
- The most popular commercial learning tool discussed here is "Elluminate" (a synchronous tool exceptionally popular in US virtual schools).
- Issues of general concern for researchers are "Instructional Design", "Professional Development", "Pedagogy" and "Standards". "Curriculum", "Content Development" and "Evaluation" (of online programmes) follow.

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[6] As it is the baseline topic of this literature review and most of the articles we have surveyed – as well as a critical keyword in our searches – the prominence of the term "Innovation" will not be analysed here.

- "Best Practice", "Good Practice" and "Effectiveness" are discussed quite often.
- "iNACOL" (International Association for K-12 Online Learning) attitudes and reports are widely hailed and openly discussed.[7]
- The "Florida Virtual School" ("FLVS") is repeatedly profiled, analysed and examined for clues as to its success; lessons are drawn from other exemplars e.g. "Michigan Virtual School".[8]
- "Emerging Technologies" and "Trends" are identified and proscribed for teacher use (the term "emerging" or "emergent" seems a synonym for *innovative* in the US K-12 context).
- We find numerous *How-To* style publications which can only be described as "Guides" for the development and delivery of online courses in the K-12 environment.

We discuss a selection of key publications in the research summary below.

6   Research summary

6.1   Policy and planning

6.1.1   General frameworks

Successful online learning begins with advance planning, and online courses cannot simply be "dropped" into an existing school curriculum as seamlessly as something more straightforward like a maths textbook. There are manifold issues to consider.

For example, many successful online schools first identify a parent, online tutor/mentor, or site facilitator working at the location where a student will access a course, to provide the first line of assistance to students; they are explicit about their expectations of support staff and parents, who are pivotal to student success (Cavanaugh 2003).

In a recent report, the Blackboard Foundation (2011) offers a study of successful US virtual programme traits, with 17 expert interviewees agreeing that the key to virtual schools success is **securing "buy-in" from teachers, administrators, parents and the community**. They specifically recommend integration as follows:

- Every virtual learning programme needs at least two champions: one to serve as an advocate in the community, and one to manage day-to-day operations.
- One to two professionals must spread the leader's vision by working in small groups or one-on-one with teachers, administrators and counsellors.
- Organisers must actively communicate with and solicit feedback from the community. An on-going dialogue should involve administrators, teachers and others, and be informational (e.g. explore virtual learning benefits, content, research and examples of success).

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[7] See http://www.inacol.org/research/ for reports, presentations and other iNACOL resources.
[8] See http://www.flvs.net/areas/aboutus/Pages/default.aspx and http://www.mivhs.org/Default.aspx?tabid=246 for more information.

- Leaders must address and dispel common misconceptions immediately (e.g. that online courses are easier, or that online teachers are less available to students).

Furthermore, the following questions must be answered for each virtual programme before proceeding:

- Will we build or buy the course content?
- How will we define and measure the rigour of a course?
- Will virtual classes be synchronous or asynchronous [or both]?
- Will the classes be delivered on a set term or a continuous basis?
- Will the classes involve teamwork?
- How will we determine the pace of online classes?
- Do we want consistency between the classes?
- What will be the role of the teacher in online courses?
- How much flexibility will teachers have with the courses?
- Is the content standardised?
- How will we measure quality?

Panel members offer the following advice:

- Offer an online, open entry/open exit, competency-based model that allows students to go through the material at their pace and on their schedule.
- Use virtual professional development to offer more courses to more teachers, focusing on topics that merge technology and pedagogy, such as 21st Century learning.
- Ensure that leaders have passion, understanding of online learning, know the difference between online education and brick- and-mortar education, and can think in terms of virtual learning's broader impact within a learning community.
- Train parents to use computers and learning management systems to access their child's classes and grades, so they have the knowledge to support their children's online learning.
- Create a mentor programme for new teachers.
- Dispel common misconceptions about online learning as they arise.
- Gain decision-maker approval and funding prior to implementing the programme; actively communicate with and solicit feedback from the learning community.

A number of US-based organisations offer their own frameworks for preparing, implementing and evaluating schools-based online courses. The National Education Association (2002) makes general recommendations in these areas:[9]

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[9] Full text at http://www.nea.org/home/30113.htm; useful summary from http://www.neirtec.org/products/techbriefs/9.htm

- *Curriculum*. Online curricular offerings should be challenging, relevant, and aligned with appropriate standards for student learning.
- *Instructional Design*. Online courses should be designed to take advantage of the online learning environment and support the development of 21st-century learning skills.
- *Teacher Quality*. Teachers should be skilled in the subject matter, learning theory, technologies, and teaching pedagogies appropriate for the content area and the online environment.
- *Student Roles.* Students should be actively engaged in the learning process and interact on a regular basis with the teacher and online classmates.
- *Assessment.* Assessment should provide opportunities for students to reflect on their own learning and work quality during the course, and offer an opportunity to demonstrate mastery of content.
- *Management and Support Systems.* Support systems should provide resources to teachers, students, and parents comparable to those provided by face-to-face courses, and special support necessitated by the unique circumstances of the online environment.
- *Technological Infrastructure*. The technology behind the course should work reliably, simply, and economically. Technical assistance should be available whenever needed by users.

Berge and Clark (2009) synthesise the work of others cited in this report, and advise that once a school or programme is poised for implementation, the course organiser needs to:

- Set virtual learning programme goals and objectives.
- Develop a communication plan and begin building a positive image and stakeholder support.
- Establish development teams as needed in key areas, consider appropriate curriculum and instruction models, and create development timelines.
- Consider the district's capacity and willingness in terms of resources (funding, staffing, equipment, etc.) to build the components of a virtual school programme.
- Consider and select virtual learning providers and external partnerships to provide components the district/school will not be building (at least initially).
- Build district technology, curricular, instructional, and administrative capacity as needed, based on "build or buy" decisions.
- Institute performance assessment measures at the beginning of the online learning programme.
- Continually evaluate the programme for improvement and accountability purposes.
- Demonstrate and communicate the success of the programme to district stakeholders. (Berge & Clark 2009)

Others explore related themes for those planning to deploy virtual programmes. Davis and Niederhauser (2007) examine the roles and responsibilities for today's administrators within online learning; Baskin and Anderson (2003) warn that online teachers may feel an increase in workload and dissatisfaction with the teaching experience. One group finds that support services will be considerable contributors to increasing course completion rates; mentors, on-site support staff,

counselling, and quality technical support will all result in positive outcomes (NACOL n.d.). For more on the positive role of the "mentor", see DiPietro (2010) and Davis and Niederhauser (2007), among others.

Successful schools are seen as self-examining, and have been found to **plan for internal and external evaluation measures for success**. They may perform surveys of students, teachers and site coordinators; analyse for cost-effectiveness; and perform annual evaluations of teachers and students (Cavanaugh 2003). Metrics may range from qualitative benchmarks, such as enrolment, retention, passing rates, dropout rates, number of highly qualified teachers and comparisons of standardised test scores (where available), to qualitative measures, such as online evaluations and anecdotal stories (Blackboard 2011).

For a number of illuminating case studies of successful virtual schools in action, see the annual report *Keeping Pace with K-12 Online Learning* (2011)[10] or *A National Primer on K-12 Online Learnin*g, version 2 (2010).[11]

In particular, policymaker and planners for larger initiatives might explore the *Keeping Pace with K-12 Online Learning* online learning implementation guide (pages 52-61). In these pages on "Planning for Quality" – which are meant to printed and lain end-to-end – a simple timeline layout presents an organised strategic planning process; decision-making guidance in four focus areas (content, teaching, technology and operations); and programme implementation tips. **Planners are advised to include key stakeholders and agree on defined educational goals for a targeted group of students as first steps**.

In any event it is important to be patient when developing new online programmes:

> *Remember that successes like ours took a whole lot of time. Let your program grow gradually – don't try to take on the whole world. Learn from those who went before you.* (Blackboard 2007)

6.1.2 Emerging standards

A number of US organisations are working to establish standards for course creation and delivery in virtual schools. Online courses must address the unique social, educational, and emotional needs of high (secondary) school students and standards must be established for this purpose (NEA 2002). An iNACOL *Survey of Policy and Practice of K-12 Schools Around the World* endorses establishment of national standards for quality online courses and quality online teaching as a possible next step for many countries. Standards may provide a more consistent experience, and may influence student achievement, retention and satisfaction in online courses (Barbour et al. 2011).

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[10] See http://kpk12.com/cms/wp-content/uploads/KeepingPace2011.pdf
[11] See http://www.inacol.org/research/docs/iNCL_NationalPrimerv22010-web.pdf

The Quality Matters (QM) Program, which released standards it intends to revise every two years to keep them up to date, has established its own rubric for online education in US grades 6-12 (though its ideas are applicable in numerous other contexts). QM standards, which adapt ideas from existing virtual-learning standards such as those published by SREB and iNACOL (Ash 2011), read as follows:

- *General Standard 1*. The overall design of the course is made clear to the student at the beginning of the course.
- *General Standard 2*. Learning objectives are clearly stated and explained. They assist students in focusing their effort in the course.
- *General Standard 3*. Assessment strategies use established ways to measure effective learning, evaluate student progress by reference to stated learning objectives, and are designed to be integral to the learning process.
- *General Standard 4*. Instructional materials are authoritative, up-to-date and appropriately chosen for the level of the course.
- *General Standard 5*. Meaningful interaction between the teacher and students, among students, and between students and course materials is employed to motivate students and foster intellectual commitment and personal development.
- *General Standard 6*. Course navigation features and the technology employed in the course foster student engagement and ensure access to instructional materials and resources.
- *General Standard 7*. The course facilitates student access to institutional services essential to student success.
- *General Standard 8*. The face-to-face and online course components are accessible to all students.
- *General Standard 9 — Compliance Standards*. This section of the rubric is optional and may be tailored to particular requirements or mandates at the [regional] level. These requirements may deal with subject matter standards, inclusion of specific information in the course outline or syllabus, mandated communications, etc. Up to 10 standards may be added in this section.[12] (QM's Rubric Standards 2010)

In the interest of nationwide accountability, in the US, the "Common Core State Standards Initiative" – a state-led effort coordinated by the National Governors Association Center for Best Practices and the Council of Chief State School Officers – is presently being developed. The initiative seeks to bring diverse state curricula into alignment with each other by following the principles of standards-based education reform, which is seen as a critical first step toward creating an online learning accountability system. Initial standards have been developed, with more than 40 states adopting them as of autumn 2011 (*Keeping Pace* 2011).

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[12] See http://www.qmprogram.org/g6-12-rubric-standards-0

6.1.3 A note on funding

The issue of costing and funding virtual schooling is a different and much broader one, specific to each country and regional model. However, given the unprecedented success of virtual programmes in US schools, a brief glimpse of into their funding mechanisms is worthwhile.

General costs are categorised in a broad US survey of virtual schools (*Keeping Pace* 2011) as follows:

- Teachers and instruction
- Curriculum and instructional materials
- Technology and infrastructure
- School outreach
- School office

Funding methods may include:

- ADA/ADM: Many states fund schools based on *average daily attendance* (ADA) or *average daily membership* (ADM).
- Count day: Some states (e.g., Nevada and Colorado) have certain "count days", in which per-student funding is generated based on enrolment on one or a minimal number of days.
- Size-based: A few states fund on something akin to a sliding scale, with funding decreasing on a per-student basis as the total number of students increases.

A few states (e.g. Florida, Texas and Maine) have implemented online school funding based on successful completion, instead of on time or a proxy for time.

Generally speaking under the US system, in state-wide virtual schools, most states fund the school at a per-student level of between $6,000 and $7,000 per year (*Keeping Pace* 2011).

The aforementioned Blackboard panel of experts (with budgeting experience at a per-school or per-region level) offered these related "lessons learned" (2011):

- Reallocating existing funds (e.g. those previously allocated for face-to-face professional development, physical textbooks and travel expenses) is the most common way to cover expenses associated with virtual learning initiatives.
- Virtual professional development courses can be considerably more cost-effective.
- Charging teachers to take courses online and students for optional (supplemental) classes can create a new revenue stream.
- Districts or allied schools that that sell their course materials to other districts generate additional funding for their own virtual learning programmes.
- When new facilities are built, schools no longer pay for wired classrooms – "everything is wireless".

Of course, this is just a quick look at another very diverse topic – to draw specific conclusions, a separate study of the costing and funding of online schools would be required.

6.1.4 Case study: Florida Virtual School (FLVS)

The Florida Virtual School (FLVS) is the world's largest and, by most measures, most successful virtual school. Some might find it useful to know how this unusual entity – which boasted 122,702 student course completions in 2010 – is structured and operated.

Florida TaxWatch (2007) examines FLVS closely, asserting that "programs that work must be identified, replicated, and enhanced; those that do not must be eliminated."

- School Funding is tied directly to student performance.
- FLVS students recently outperformed their state-wide counterparts on two independent assessments, accomplished with less money than typically spent on traditional instruction.
- FLVS views parents as "partners in student success", and they are provided a Guardian Account with full access to assignments and grade-book.
- Teachers are available from 8:00 a.m. – 8:00 p.m. weekdays and additional hours on weekends. Parents receive one additional telephone call per month, monthly progress reports and regular email updates.
- FLVS teachers are Florida-certified in their content area. Not all are Florida residents, though, and they actually reside all over the country.
- Teachers are brought in at least once a year for state-wide training.
- Faculty members function in Learning Communities; an Instructional Leader provides guidance and administrative oversight to approximately 55 teachers.
- Teachers have access to instructional assistants on a part-time basis.

Florida Virtual School has been built on many of the same principles of good practice endorsed by the Blackboard panel of experts earlier in this report (Blackboard 2011). Florida TaxWatch 2007 finds that elements that have enabled FLVS to succeed include:

- Steadfast support by the Florida Legislature
- Stability of leadership
- Sustained interest by the [regional] business community
- Powerful networking throughout the country
- Consistent focus on its core mission: "To deliver a high quality, technology-based, education that provides the skills and knowledge students need for success in the 21st century"

See also Findlay (2009) for more on the Florida Virtual School.

6.2 Advice for teachers

While little research exists to address the best practices of virtual school teaching in the K-12 context (DiPietro et al. 2008), the roles and responsibilities of today's teachers within online learning are

frequently and exhaustively examined (Davis and Niederhauser 2007). Many agree that effectiveness in distance education appears to have more to do with who is teaching, who is learning, and how that learning is accomplished, and less to do with the medium (Rice 2006). Indeed, the traits that make a successful online instructor are seen as the same as those for any successful instructor: namely, good communication and classroom organisation skills (Roblyer 2006). Teachers hold the key to virtual learning success (Blackboard 2011); the elements of excellent teaching that are most difficult for technology to replace will increasingly differentiate student outcomes (Hassel & Hassel 2011).

Successful online teachers do still require a unique set of skills, however, which includes learning to capitalise on distance learning strengths while minimising constraints, using verbal and nonverbal presentation skills specific to distance learning situations, working collaboratively with others to produce effective courses, using questioning strategies, and involving and coordinating student activities among several sites (Cyrs 1997, Roblyer 2006).

Cavanaugh (2003) notes that, just as in the traditional classroom, online learning is enhanced when teachers are actively involved in the learning process.

- Frequent communication, feedback, and scheduled tutoring or "skill checks" benefit learners and contribute to the structure and communication that most K-12 learners need in the absence of face-to-face meetings.
- A uniform method for online discussions helps students plan participation and allocate time to prepare; student and teacher roles in online discussions must be defined and understood. Discussions should be designed with open-ended questions which lead to higher-order thinking and deeper learning.
- Further, courses designed to require more time applying the course content through writing and speaking correspond to higher achievement, as do simulations, manipulatives, and tutorials that offer student feedback.

Several organisations are working to extrapolate guidelines for online teachers. The International Society for Technology in Education's *NETS and Performance Indicators for Teachers* (2008) suggests that online teachers meet the following standards and performance indicators:

- Facilitate and inspire student learning and creativity
- Design and develop digital-age learning experiences and assessments
- Model digital-age work and learning
- Promote and model digital citizenship and responsibility (ISTE 2008)

Teachers must also know what constitutes quality in online teaching and to what standards they will be held accountable. The NEA (2002) suggests they explore the following questions:

- What do I need to know and how can I learn this prior to teaching online?
- Can I participate in the development of the curriculum?
- Am I required to use lessons that are designed by others?

- How will this change my assessment of student learning?
- How can I ensure that the student is doing his/her own work?
- How will this change the way I interact with parents/ guardians?
- What kinds of support structures will be in place to assist me?
- How will teaching online change the way I am evaluated?
- How will this affect my overall workload?
- Who owns the lesson materials and teaching ideas I use online?
- Will I be compensated if others use my designs and ideas or if they are marketed by [a] "provider"? (NEA 2002)

iNACOL's national standards for quality online teaching are being used in the professional development and evaluation of online teachers. There is a particular focus is on what online teachers should know, understand, and be able to do, summarised as follows:

- Standard A: Knows primary concepts and structures of effective online instruction and is able to create learning experiences to enable student success.
- Standard B: Understands and can use both existing and emerging technologies that effectively support student learning and engagement.
- Standard C: Plans, designs, and incorporates strategies to encourage active learning, application, interaction, participation, and collaboration.
- Standard D: Promotes student success through clear expectations, prompt responses, and regular feedback.
- Standard E: Models, guides, and encourages legal, ethical, and safe behavior related to technology use.
- Standard F: Is cognisant of the diversity of student academic needs and incorporates accommodations as needed.
- Standard G: Demonstrates competencies in creating and implementing online assessments that ensure validity and reliability of the instruments and procedures.
- Standard H: Develops and delivers assessments, projects, and assignments that meet standards-based learning goals; assesses learning progress by measuring student achievement of goals.
- Standard I: Demonstrates competency in using data from assessments and other sources to modify content and guide student learning.
- Standard J: Interacts in a professional, effective manner with colleagues, parents, and other members of the community to support student success.
- Standard K: Arranges media and content to help other users transfer knowledge effectively. (*iNACOL Quality Online Teaching*, 2011)

In an unpublished research briefing, a literature review by NACOL researchers (n.d.) finds the following key factors in effective programmes (note the more specific focus on teachers and technology):

- Student perceptions of their learning environment may relate to the amount of professional development their teachers receive in technology.
- An instructor's technological skill may be a significant factor in student success.
- Professional development is required for at least three different roles: designer, teacher and facilitator.
- Simulations, online tutoring and tutorials that offer student feedback can improve performance, providing students with the visual and cognitive support they need to master abstract concepts (NACOL briefing, n.d.).
- Online students value frequent and timely responses (communication with instructors is sometimes identified as the most valuable aspect of online courses).
- Simultaneous use of various teaching and communication tools enables collaboration, one-to-one coaching, oral practice, and other compensations for a lack of visual cues.

In one survey of virtual school instructors, a consensus identifies online presence, diligent student monitoring and enjoyment of technology as contributing to teaching success. Instructors also identify face-to-face student mentors as a key component (see policy and planning section above) (Black et al. 2009). Other researchers discuss cultural concerns (Collis 1999), use of competency-based learning pathways and the timing of assessment (e.g. upon module completion rather than the end of a school year (Keeping Pace 2011).

In one creative and thoughtful article, Savery (2005) endorses a "VOCAL" approach to online instruction, in which teachers are Visible, Organised, Compassionate, Analytical and Lead-by-example. He focuses on issues of online presence and how teachers might promote this; on closeness and the importance of getting to know one's students; and on teacher modelling to guide students new to the online realm. Similarly, Barbour and Hill (2011) suggest that e-teachers devise strategies that allow students to get to know their online classmates better (in an attempt to develop a sense of community online).

Teachers unfamiliar with the basics of online learning structures are advised to explore *A National Primer on K-12 Online Learning* (2010) at http://www.inacol.org/research/docs/iNCL_NationalPrimerv22010-web.pdf, which defines online learning terms and provides simple overviews of common online class arrangements in the primary and secondary school setting.

6.3   Teacher training (professional development)

The issue of teacher training (or professional development) has been set aside as a topic for another research team under the VISCED project, and is therefore not treated specifically in this report. The issue is such a broad one that a separate literature search is entirely appropriate.

The critical need for high-quality teacher training is nonetheless addressed directly by many of the publications included here. See for example Wilson and Stacey (2004), Davis and Roblyer (2005),

Cavanaugh and Hargis (2010), Davis and Rose (2007), Signer (2008), DiPietro (2010), Oliver et al. (2010) and others.

6.4 Pedagogy and learning styles

Ferdig (2006) observes:

> *…We can support teachers with pedagogically sound technology; and we can learn from teachers who make technology pedagogically sound... One will always require the other; good pedagogy is part of a process, and the process includes teaching with good pedagogy.*

It is primarily for the purposes of organising this literature base that pedagogy has been set aside for separate treatment, considered separately from both teachers and technology. In the virtual schools context, these topics are not always clearly separated. We draw on a meagre evidence base in drafting this section, presenting more of a literature review than guidance in good practice.

The inherent nature of delivering K-12 course content via a web-based medium implies the need to re-conceptualise school pedagogy DiPietro (2010). Teachers' decisions related to the choice of pedagogical activities play an important role in effective use of the tools (Murphy & Coffin 2003); online teachers need to have not only an excellent grasp of their given content area, but also an appreciation of how technology and the online environment affect the content and the pedagogy of what they are attempting to teach (Archambault 2010). In many cases pedagogy emerges as more important than media in online teaching (Murphy et al. 2011).

Other publications addressing pedagogy in virtual programmes include:

- Kapitzke and Pendergast (2005), who report a case in which the pedagogical opportunities presented by virtual schooling are not fully realised.
- Koehler and Mishra (2005) assess the development of Technological Pedagogical Content Knowledge (TPCK) in educational technology.
- Muris (2001) reviews methods of adapting online education to different learning styles.
- Anderson (2008) cites various constructivist, collaborative and inquiry-based learning models which demand that students be active and engaged and that this engagement leads to significant improvements in learning and attitudes towards learning.

Brill and Park (2008) examine the specific emerging technologies laid out in the 2008 *NMC Horizon Report*,[13] relating them to "engaged learning" and the features and students of the "Interaction Age" in seeking best practice in improved teaching and learning. They explore the intersection of these

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[13] See http://www.nmc.org/horizon-project

three areas in examples which connect engaged learning with emergent technologies and the "digital native"[14] learner as follows:

TABLE 3
Connecting Engaged Learning with Emergent Technologies and the Digital Native

Common Indicator of Engaged Learning	Emerging Digital Technologies Supporting Engagement Indicator	Alignment with the Digital Native Student
Ownership of and responsibility for learning goals	Mobile learning devices with unique, individual scaffolding designed for and built in	Capitalizes on their early access to and frequent use of mobile devices to achieve personal goals
Interactive, collaborative, and generative approach to learning within the context of solving authentic problems	Virtual worlds and game-based learning designed as realistic learning spaces which enable learners to manipulate a variety of variables	Connects with their pervasive habits to interact and stay in touch via digital means (e.g., mobile phone, Web spaces, email, etc.)
Facilitative role of experts, teachers, and "expert" resources	Mobile device or pervasive learning space where expert learning content is designed for and embedded	Speaks to their use of widely available digital information resources to move through the world and achieve personal goals

Figure 2. Brill and Park (2008) explore possibilities for engaged learning today

Anderson and Dron (2011) present a thorough analysis of general online pedagogy (including schools), defining and examining three past generations of distance education pedagogy: cognitive-behaviourist, social constructivist, and connectivist. These are outlined in the table reproduced below:

Summary of Distance Education Pedagogies

Generation of distance education pedagogy	Technology	Learning activities	Learner granularity	Content granularity	Evaluation	Teacher role	Scalability
Cognitive–behaviourism	Mass media: Print, TV, radio, one-to-one communication	Read and watch	Individual	Fine: scripted and designed from the ground up	Recall	Content creator, sage on the stage	High
Constructivism	Conferencing (audio, video, and Web), many-to-many communication	Discuss, create, construct	Group	Medium: scaffolded and arranged, teacher-guided	Synthesize: essays	Discussion leader, guide on the side	Low
Connectivism	Web 2.0: Social networks, aggregation & recommender systems	Explore, connect, create, and evaluate	Network	Coarse: mainly at object and person level, self-created	Artifact creation	Critical friend, co-traveler	Medium

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[14] See http://en.wikipedia.org/wiki/Digital_native

Figure 3. Anderson and Dron (2011) summarise distance education pedagogies

They conclude that learning modes do not replace but rather complement each other over time, and that high-quality distance education must exploit all three generations as determined by the learning content, context, and learning expectations. This means, of course, that distance educators and students must be skilled and informed enough to select the best mix(es) of both pedagogy and technology. They consider fourth- and even fifth-generation distance technologies as difficult to define, except for their predictable use of intelligent databases that incorporate Web 2.0 or semantic web technologies. In this object- or activity-based model of learning, in which objects of discourse take precedence over the networks that join them together, it is not so much a question of building and sustaining networks as finding the appropriate sets of things, people and activities. (The OU's CloudWorks[15] is identified as an example of this new trend.)

In a relevant piece, Asselin and Moayeri (2011) describe ways of using new literacies and new forms of texts for locating and critically examining information, and ways of sharing and building knowledge within the participatory and creative landscape of Web 2.0. Teachers can tap into the social attractions of Web 2.0 applications to support student learning (instead of using commercial search engines like Google and Yahoo). These applications are not only new technologies, but new genres and new literacies as well and thus require new forms of contribution. Teachers must therefore question:

> *Are our students just writing a series of short term papers and posting them under the guise of blogs, wikis, or social networks; or are they using the software in innovative ways that stimulate them to learn, collaborate, share, and create in democratic ways?*

Teachers are directed to social networking sites (SNS) such as Web 2.0 classroom (http://web20classroom.blogspot.com) and Ning in Education (http://education.ning.com/) to help adapt to this new pedagogical and critical framework.

DiPietro (2010) identifies a need for further research into the pedagogy of K-12 virtual school teaching in order to understand the coordination of content, pedagogy, and technology underlying the delivery of a virtual school course. We agree with her assessment and echo her plea, and in particular would have liked to include examples of good practice in the pedagogy of Web 2.0.

6.5   Content development and instructional design

Researchers have thoroughly examined the state of course development and instructional design in the schools context. How schools obtain course content varies widely, with some organisations opting to create it, others purchasing it and still others pursuing a hybrid buy/build strategy (e.g.

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[15] See http://cloudworks.ac.uk/

purchasing content initially before transitioning to in-house development) (Blackboard 2011). Content may be developed by teams or individuals, by teachers and/or technologists.

Many agree that, the more clearly expectations and processes are laid out, the better the outcome. US virtual schools often develop a rubric for course quality, facilitator rules for what they can and cannot change in a course, course templates to maintain the same look and feel across courses, and a selection of extra resources (Blackboard 2011).

Some schools allow teachers great freedom in course design, while others have found that this does not reflect long-term thinking. Members of the Blackboard expert panel differ widely on the amount of control required over content development, but all support a consistently applied process to make that determination. One commented:

> When virtual learning programs start out small, it's tempting to allow people the freedom
> to do whatever they want. However, when freedom can't scale, fragmentation is the result.

Others advise that online instructional strategies include collaborative project-based design, clear expectations/requirements, concrete yet flexible deadlines with some flexibility, timesheets, study guides, and rich interactive collaboration among students and teachers. Courses must be straightforward and consistent in their design, providing clear instructions and expectations, and making use of appropriate media (NACOL n.d.). A study by Hastie et al. (2007) finds that when a simplified and "minimalist" approach to instructional design is adopted, students contribute significantly more information to online discussions, faster, and demonstrate higher levels of learning.

Control over course content – or lack thereof – can be a major area of concern for teachers. When teachers do not have control over the content, this can become a source of frustration; content providers may want to consider allowing greater access for teachers to incorporate their own lesson ideas, as well as the ability to make corrections or revisions to curriculum directly, allowing the medium to capitalise on teachers' knowledge and experience (Archambault 2010).

Barbour (2007) develops guidelines that future course developers might utilise, examining a combination of synchronous instruction using Elluminate Live and asynchronous instruction using WebCT. These are broken down as follows:

1. *Preparing to Develop*. Significant advance planning is required.
2. *Simple Navigation, but Diverse Content Presentation*. Every lesson should feel different to learners.
3. *Summarize and Personalize*: Course developers should provide a summary which includes examples personalised to the students' own context.
4. *Clear Instructions and Expectations.* Course developers should ensure students are given clear instructions which model expectations of the style and level of work required.
5. *Use of Text and Visuals*. Course developers use minimal text and use visuals to replace or supplement text when applicable.

6. *Smart Use of Multimedia and Interactive Elements*. Course developers should use multimedia to enhance the content, and not simply because it is available.

7. *Who to Target*. Course developers should develop their content for average or below average students, while including enrichment activities for above average students. (Barbour 2007)

In 2011, iNACOL released its *National Standards for Quality Online Courses*, version 2, the results of a refreshed research review and survey of online course quality criteria. iNACOL endorses the previously published higher-education focused standards for online courses; see http://www.sreb.org/page/1295/publications.html (not included in this study due to tertiary focus).

iNACOL reiterates, enforces and enhances the views seen elsewhere in this review. High-quality online courses require the following key components:

- *Content development.* The course provides online learners with multiple ways of engaging with learning experiences that promote their mastery of content and are aligned with state or national content standards.
- *Instructional design.* The course uses learning activities that engage students in active learning and provides students with multiple learning paths; the content is based on student needs and provides ample opportunities for interaction and communication (student to student, student to instructor and instructor to student)
- *Student assessment.* The course uses multiple strategies and activities to assess student readiness for and progress in course content and provides students with feedback on their progress.
- *Technology*. The course takes full advantage of a variety of technology tools, has a user-friendly interface and meets accessibility standards for interoperability and access for learners with special need
- *Course evaluation and support.* The course is evaluated regularly for effectiveness, using a variety of assessment strategies, and the findings are used for improvement. The course is kept up to date in content, course design and technologies. Instructors and students are prepared to teach and learn in an online environment and are provided on-going support.

A scoring rubric is also included for use by educators in their own programmes. (*iNACOL Quality Online Courses* 2011)

Non-traditional course designers, e.g. traditional teachers, may share common needs during course development efforts. Findings suggest virtual schools can better support non-traditional course designers by providing technological leadership, regular feedback, and clear expectations. Ideally, designers need professional development in replicating model courses, using course management systems, assessing learners online, designing with copyright and safety issues in mind, integrating Web tools, and developing course documentation (Oliver et al. 2010).

6.6 Technological innovation

Numerous technologies are being used to great effect in today's virtual schools, and in our literature review we found proponents of many tools and systems. We examine many of these below.[16]

However, the Elluminate Live! tool[17] emerges in our research as a top candidate for use in any school piloting virtual programmes, due to its wide-ranging success in virtual schools across the US. Its synchronous collaboration model, or "virtual classroom", allows for real-time interaction between students and instructors via integrated VoIP and teleconferencing, application and desktop sharing, polling and quizzing, and session recording – as well as technologies such as multipoint videos, shared whiteboards, web tours, and breakout rooms, adding what one author describes as "the value of real-time interaction rather than just static content" (Arora 2009).

6.6.1 Synchronous versus asynchronous tools

An on-going comparison of the respective merits and constraints of synchronous and asynchronous learning tools exists in the literature reviewed. Many successful virtual schools use a synthesis of both to best effect, and their ability to complement each other is addressed directly. **Most authors favour synchronous tools like Elluminate and Videoconferencing for their immediacy and sense of "presence," but many learning technologists would prefer to see these deployed in a broader teaching context – i.e. one using both synchronous and asynchronous tools together.**

In a study by Barbour and Hill (2011), students find asynchronous coursework (e.g. over WebCT) routine and unchallenging, and often lack the internal motivation to complete asynchronous assignments. Conversely, they are engaged during their Elluminate Live sessions, during which they communicate actively with their teacher and each other. Similarly, Berge and Clark (2009) acknowledge problems with asynchronous online teaching; there are many conveniences afforded by anytime, anyplace teaching and learning, but it can lead to problems for students with poor time-management skills or a tendency to procrastinate. Hastie et al. agree (2007), stating that "The online synchronous cyber classroom provides learners with more authentic and engaging learning activities enabling higher levels of learning compared to purely asynchronous modes of self-paced learning".

Barbour 2007 examines the effective use of a combination synchronous and asynchronous system used in remote regions of Canada, in which Elluminate Live lectures and chats are complemented by WebCT as follows:

- Elluminate provides for two-way voice, a shared, interactive whiteboard, instant messaging, application sharing, breakout rooms, and interactive quiz and survey management.

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[16] Ferdig (2006) notes that argued that a good technology innovation involves pedagogy, people and performance, but we have done our best to address technology discretely in this section.

[17] See http://www.elluminate.com/Services/Training/Elluminate_Live!/?id=418

"Teachers are able to provide synchronous instruction in much the same way that they would in a traditional classroom."

- WebCT provides an asynchronous discussion forum, calendar, e-mail system, and a place to house the course web pages. The web pages are designed by a team of two individuals: a teacher acting as a subject matter expert and a multimedia specialist to add images and interactive items into the content.

(Regrettably, Barbour concludes that, as recently as 2007, isolation in remote and rural communities may still cut students off from the affordances of online learning, due to slow uptake in broadband speeds, mobile technologies and networks, etc.)

Poggi and Di Blas (2008) find that forums offer a significant contribution to overall educational impact (when considered within a more eclectic "live" 3D learning experience). Murphy et al. 2011 find both learning modes beneficial as well; asynchronous online teaching provided support for self-paced, highly independent forms of secondary distance education, supplemented by synchronous online teaching for answering questions and troubleshooting. Roblyer et al. 2007 discover that synchronous and asynchronous formats have the potential to be equally effective and motivational to students.

A few specific technological trends are reviewed below.

6.6.2 Mobile learning

Brown (2008) explores mobile learning (m-learning), hailing it as "the gateway to e-learning for most learners in Africa as the rapidly growing wireless infrastructure increasingly fulfils their access needs." He proposes that, as a natural extension of e-learning, m-learning has the potential to make learning even more widely available and accessible than it is within traditional e-learning environments.

See Gubacs-Collins and Juniu (2009) on the use of tablet PCs in physical education; Murray and Olcese (2011) and Zwang (2011) focus on iPads; Shumack and Reilly (2011) on Video podcasting in physical education.

6.6.3 Virtual worlds

Barkand and Kush 2009 are among many (e.g. Inman 2010, Merchant 2009) who evaluate the use of 3D learning environments, such as Second Life,[18] in schools – and US high schools in particular. They find virtual reality helps to create a vivid sense of community, in part because it allows users a 3D avatar whose gestures, moods, and customisable appearance to project a "cognitive presence" unavailable in other learning tools.

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[18] See http://secondlife.com/destinations/learning

6.6.4 Videoconferencing

Videoconferencing is quite popular in remote communities. **It is not seen as presenting a sufficiently rich learning experience on its own, however.**

In a study of five schools, Anderson (2008) reveals the effective use of videoconferencing for enrichment, professional development, and administration – with less successful application as the primary tool for distance education delivery. It simply does not provide the level of student engagement with teachers, other students or content needed to sustain their attention, enthusiasm and ultimately high levels of learning. However, it can be very effectively used as part of a broader range of networking tools, and in particular those which provide students access to Internet-based resources (e.g. Learning Management Systems, blogs, wikis, polling, quizzes, web safaris, and applications sharing). These exploit the medium and allow students to interact with each other and the content, rather than simply listening to "teacher talk" (Anderson 2008).

More hopefully, Lawson and Comber (2010) find that the educational use of videoconferencing technology in schools is not a uniform phenomenon; teachers exposed to its potential quickly find new ways of exploiting its pedagogical possibilities. Bell and Unger (2003) report on one successful implementation in Cape Elizabeth Middle School in Maine, USA – allowing students to engage in interactive communications with experts outside of the region, e.g. at the Bronx Zoo in New York.

Other views are proffered by Lockee et al. (2005) and Lai and Pratt (2009), who look at constraints and implementation barriers.

6.6.5 Other technologies of note

Borjoa (2005) and others focus on the growing popularity of podcasting in K-12 students in the U.S. Ferris and Wilder (2006) examine the great potential of wikis in education; Richardson (2006) looks at blogs, wikis, podcasts, and other powerful web tools for their potential to engage students in the world of synchronous information feeds and interactive learning. Towell (2009) suggests Mashable, Ning, Second Life, and other innovations.

Murphy et al. (2008) interrogate instant messaging (IM) in a context of virtual schooling, finding that e-teachers are embracing the technology in recognition of high-school students' proficiency and comfort with it. Although challenges arise when a tool that typically serves solely a social purpose is appropriated into an educational context, the benefits of IM in promoting social presence and a "sense of community" seem to outweigh these, even allowing e-teachers to establish individual rapport with students during non-instructional time. Fullick (2006) further explores synchronous web-based communication using text as a means of enhancing student discussion.

The *Horizon Report* (Johnson et al. 2011) embraces cloud computing, mobile learning, game-based learning, and open content as "emerging" to prominence in K-12 education (be it blended or otherwise) within the next few years. Learning analytics and personal learning environments are on the horizon for adoption within four to five years.

7   Conclusions

Although a preliminary base of research into good practices in virtual schools has now been established, more research into this area is still required. In analysing their own lessons learned from Michigan Virtual School teachers, DiPietro et al. 2008 state:

> …*Without research on best practice, it is impossible to identify exemplary instructors. Without research on subjectively-defined exemplary instructors, it is impossible to determine best practice.*

Within this context we have done our best to extrapolate practices which – if not yet seen as "best practices", per se – might at least be seen as "good" and "innovative" within the broader educational community. Guidance in policy and planning, advice for teachers, pedagogy and learning styles, content development and instructional design, and technological innovation have all been explored. Where available, we have reviewed emerging US standards in the hope that these will transfer to a broader European context.

We hope sincerely that organisers and teachers within the VISCED pilot institutions can draw on this document when developing innovative good practice for their upcoming teaching terms.

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